



Small Ruminant - CRSP

MONITORING OF LEVELS OF GASTRO-INTESTINAL NEMATODES AT SUNGAI PUTIH

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ABSTRACT

Levels of gastro-intestinal nematodes were monitored in 26 ewes of 6 breeds : S (Sumatra Thin-Tail), H (Virgin Island and 90% Virgin Island), H1 (Virgin Island x Sumatra Thin-Tail, F1 generation), B1 (Barbados Blackbelly x Sumatra Thin-Tail, F1 generation), E1 (Virgin Island x East Java Fat-Tail, F1 generation) and HC (Virgin Island x Sumatra Thin-Tail, F2 and subsequent generations). These animals were in a large flock with grazed from 08.00 a.m. - 16.00 p.m. under rubber trees.

Four animals of each breed were sampled every two weeks from February 1993 to January 1994. Every three months anthelmintic was given to all sheep whic the flock, two days prior to movement a new pasture location.

The parameters observed were Faecal Egg Counts and Packed Cell Volume. Time of sample and individual animal within breed had significant ($P < 0.01$) effects on levels of gastro-intestinal nematodes at Sungai Putih. The faecal egg counts of all breeds were similar except that the Virgin Island ewes had lower egg counts of worm than the other genotypes.

This result is encouraging as it shows that introducing Virgin Island hair sheep to North Sumatra does not increase susceptibility to gastro-intestinal nematodes.

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ABSTRAK

Telah dimonitor tingkat infestasi cacing nematoda saluran pencernaan pada 26 induk domba yang terdiri dari 6 bangsa : S (Domba ekor tipis Sumatra), H (Virgin Island dan 90% Virgin Island), H1 (Persilangan pertama Barbados Blackbelly x Domba ekor tipis Sumatra), E1 (Persilangan pertama Virgin Island x Domba ekor gemuk) dan HC (Persilangan kedua Virgin Island x Domba ekor tipis Sumatra dan persilangan dari hasil persilangan pertama). Domba digembalakan dibawah pohon karet dari jam 08.00 pagi-16.00 sore.

Sampel ditentukan empat ekor dari empat setiap bangsa yang diambil sekali dua minggu, mulai dari Februari 1993 sampai Januari 1994. Sekali tiga bulan diberikan obat cacing pada semua domba yaitu pada saat dua hari sebelum pindah ke lokasi padang penggembalaan yang baru.

Parameter yang diukur adalah Jumlah telur cacing feses dan PCV. Pengaruh waktu pengambilan sampel dan individu didalam bangsa adalah berbeda nyata ($P < 0.01$) terhadap tingkat infestasi cacing nematoda saluran pencernaan di Sungai Putih. Jumlah telur cacing pada setiap bangsa hampir sama kecuali domba induk Virgin Island lebih rendah dari bangsa domba lainnya.

Hasil ini sangat menggembirakan karena ini menunjukkan domba Virgin Island hair sheep yang di Sumatera Utara tidak termasuk peka terhadap cacing nematoda saluran pencernaan.

INTRODUCTION

Infestation with gastro-intestinal nematodes is amongst the most important constraints to sheep production in the tropics. In humid tropical regions including North Sumatra the control of parasitic gastro-intestinal is extremely difficult because of year-round transmission. Control is almost solely based on the use of anthelmintics at regular intervals.

However the high cost of these drugs contributes to reduced farmer income and frequent use of anthelmintics can lead to resistance of worms to these drugs.

Therefore research should be directed towards alternative strategies to control nematode infections. Control by pasture management is difficult in traditional farming systems. Another approach is to look for breeds or strains of sheep that are more resistant to parasitic infections or to the result of infection by these parasites.

The objectives of this study were to monitor the level of parasitism of ewes during a 12-month period and to compare the pattern of infection between the different genotypes of sheep at Sungai Putih.

MATERIALS AND METHODS

The study is being conducted at Sungai Putih, North Sumatra, Indonesia in the sheep flock of the SR-CRSP (Small Ruminant- Collaborative Research Support Program) at Suka Damai, and laboratory work is being done at Sub Research Institute for Animal Production (SRIAP) Sungai Putih.

Samples were taken every two weeks. The first samples of faeces for this study were obtained on February 15, 1993 and subsequent samples were taken every two weeks. PCV was measured from April 26, 1993 onwards.

The sheep graze from 08.00 a.m. to 16.00 p.m each day and at night are confined in a sheep house with a raised slatted floor. The sheep are maintained under rubber trees with a management system of pasture spelling. To control the cycle of parasitism between sheep and the pasture, every three months anthelmintic is given to all sheep then two days later they are moved to a grazing area which has been spelled for three months.

The dates on which the sheep were drenched with anthelmintic were January 13, 1993, April 5, 1993, July 13, 1993, October 7, 1993 and January 12, 1994. The first three times the sheep were drenched with Ivomec (which contains Ivermectin, dosage 0.2 mg/kg body weight) and the final two times with Multidose (which contains Levamisole and Rafoxanide, dosage 2.5 mg/kg body weight).

All six genotypes of sheep which are present at Sungai Putih are included in this research. The six breed types are:

H (Virgin Island and 90% Virgin Island),
S (Sumatra Thin-Tail),
H1 (Virgin Island x Sumatra Thin-Tail, F1 generation),
B1 (Barbadosblackbelly x Sumatra Thin-Tail, F1 generation),
E1 (Virgin Island x East Java Fat-Tail, F1 generation), and
HC (Virgin Island x Sumatra Thin-Tail, F2 and subsequent generations).

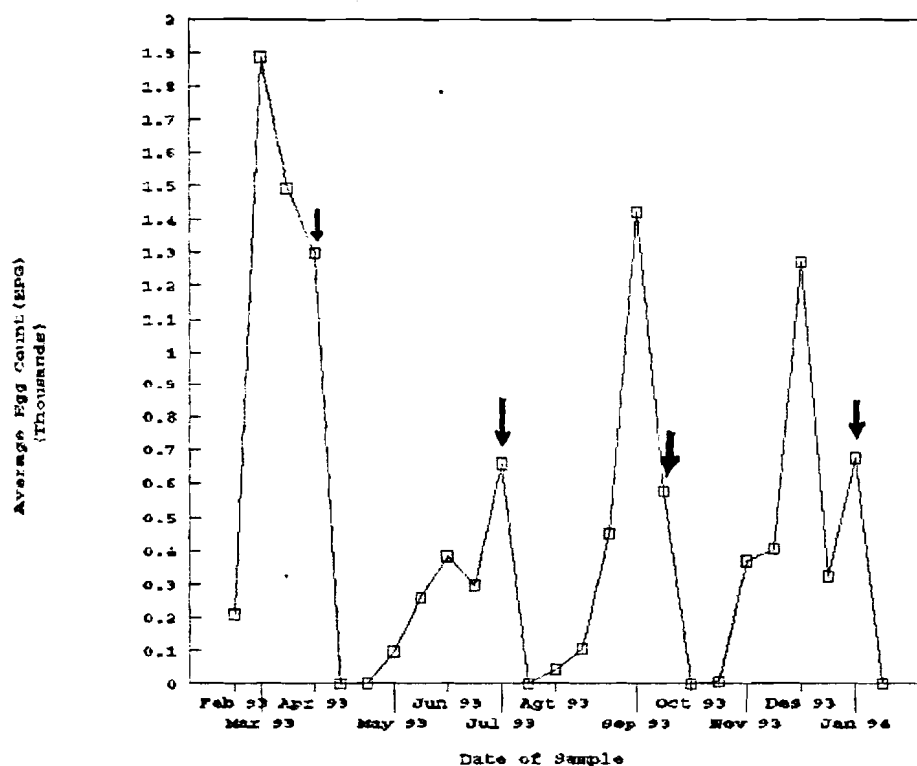
Where possible for each breed type a total of 3 young ewes born in 1992 and 2 older ewes were included in this study. When a ewe died she was replaced by another ewe of the same breed and similar age.

The variables observed are (i) number of strongyle eggs in each gram of faeces, using modified the McMaster technique (Eggs per gram/EPG) (Dorny et al., 1993) and (ii) percentage of erythrocytes in the blood (Packed Cell Volume/PCV) by means of the microhematocrit method.

All data were entered into the computer using Lotus 1-2-3. Analysis of data was performed using the General Linear Models (GLM) procedure of Statistical Analysis System (SAS). The data of strongyle egg counts were transformed using the transformation $\log(\text{epg}+1)$ before being analysed.

RESULTS AND DISCUSSION

The average faecal egg counts (epg) in all observations are shown in Figure 1. Immediately after the sheep were given anthelmintic, strongyle egg counts fell to zero, indicating that all worms in the sheep had been killed. However, the sheep soon became reinfected.



---> = Time of anthelmintic treatment

Figure 1. Average faecal egg counts EPG of ewes.

Figure 1 shows that total egg counts were higher during and shortly after the wet season, than in the dry season (May to August). This suggests that survival of worm larvae is greater when the climate is moist and when there is much vegetation.

The number of other gastro-intestinal parasites, namely monezia and coccidia, were low compared with the numbers of strongyles.

Only the samples collected at least four weeks after giving anthelmintic were included in the following statistical analysis.

Average total egg counts of Gastro-intestinal Nematodes

Analysis of variance of the data is summarised in Table 1. Time of sample, breed and individual animal within breed all had highly significant ($P < 0.01$) effects on levels of gastro-intestinal nematodes.

Table 1. Analysis of Variance of EPG values using transformation $\log(\text{epg}+1)$.

Source	DF	Mean Square	F Value	Pr>F
Time	20	85.8	17.46	0.0001
Animal(Breed)	20	25.8	5.25	0.0001
Breed	5	19.4	3.96	0.0016

The infestation levels egg of strongyles for the six breed types of sheep at Sungai Putih are shown in Table 2. The level of infestation of strongyle eggs was highest for Sumatra Thin-Tail (geometric mean 10.000 epg), and lowest for Virgin Island (geometric mean 558 epg).

Table 2. The Infestation Levels Egg Counts of Strongyle Eggs (EPG) for six breeds of sheep at Sungai Putih.

Breed	n	Least Square Mean Log(Str+1)	Standard Error	Geometric Mean EPG
H	5	2.77 ^a	0.21	558
HC	5	3.15 ^{ab}	0.21	1412
E1	3	3.56 ^{ab}	0.27	3630
H1	5	3.63 ^{ab}	0.21	4265
B1	3	3.70 ^{ab}	0.27	5011
S	5	4.00 ^b	0.21	10000

Means with the same superscript are not significantly different (P>0.05).

For all the crossbred animals (Virgin Island , Barbados Blackbelly and Fat-tail) there were no differences between genotypes. The highest infestation was found for Sumatra Thin-Tail. The lowest mean was recorded for purebred Virgin Island (H).

These data suggest that of the six breed types at Sungai Putih Virgin Island are the most resistant to strongyles. The most susceptible are Sumatra Thin-Tail. However the number of animals in this study was small and within-breed variation in susceptibility to strongyles is large compared with between-breed variation (Table 1). Thus these breed differences may not be observed in a large study.

The reason why Virgin Island ewes have lower worm egg counts than the other genotypes may be related to the fact that this breed was developed in the Caribbean which has a hot humid climate, substantial numbers of sheep and severe challenge with worms. Selection pressure resulted in the development of genetic resistance to worms in this breed.

General discussion

The findings of this research support previous studies (e.g. Wilson et al, 1993) which have shown that internal parasites are one of the major health problems of sheep in rubber plantations. There are many species of gastro-intestinal nematode present in the sheep Sei Putih, but the species causing most economic loss is *Haemonchus contortus*. This species is found in the abomasum and each worm removes about 0.05 ml blood per day from the sheep.

Sheep which are acutely infected with *H. contortus* and other parasites may die from acute anaemia (Beriajaya and Stevenson, 1986). More common is reduced productivity seen as low growth rates in young sheep (Handayani and Gatenby, 1986) and poor reproductive performance in adults.

This study has confirmed that differences in faecal egg counts between individual ewes are large compared with differences between breeds. Assuming that the resistance of sheep to helminths is moderately heritable we should be able to select resistant individuals and form a strain of sheep which is resistant to worms.

Percentage of erthrocytes in the blood

Samples of blood have been taken since April 26, 1993 and analysed in the laboratory to measure of the erythrocyte percentage (Packed Cell Volume/PCV). Average erythrocyte percentage was 26-29 percent and was not affected by factors such as breed on individual animal. All animals were apparently healthy (Table 3).

Table 3. Average percentage of erthrocytes in the blood for six breed types at Sungai Putih.

Breed	n	Least Square Mean PCV (%)	Standard Error
H	5	28.7 ^a	1.9
E1	3	28.2 ^a	1.6
B1	3	27.5 ^a	1.6
H1	5	26.2 ^a	1.2
HC	5	28.0 ^a	1.3
S	5	27.4 ^a	1.2

Means with the same superscript are not significantly different ($P > 0.05$)

Table 3 shows that the mean PCV was similar for all breeds of sheep. Beriajaya (1992) reported that the erythrocyte percentage of normal healthy sheep is between 22-33 % and our values fall within that range.

CONCLUSION

The faecal egg counts of all breeds were similar except that the Virgin Island purebred and third generation backcross sheep had lower worm burdens than the other genotypes.

This result is encouraging as it shows that introducing Virgin Island hair sheep in to North Sumatra does not increase susceptibility to gastro-intestinal nematodes. Levels of egg counts at Sungai Putih were affected by season.

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